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NEWS OF THE STRUCTURAL DIVISION OF ASCE



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JOURNAL OF THE STRUCTURAL DIVISION
PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

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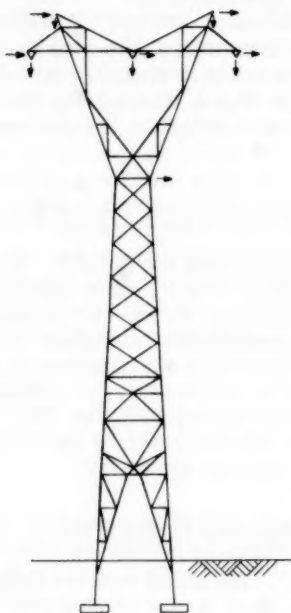
DIVISION ACTIVITIES
STRUCTURAL DIVISION
Proceedings of the American Society of Civil Engineers

NEWS

June, 1961

WORK OF THE TASK COMMITTEE ON TOWER DESIGN

This is a new committee formed to fill a definite and urgent need for an adequate governing code for the structural design of metal transmission towers. The prevailing practice and many state laws call for towers to be designed in



accordance with the requirements of the 5th Edition of the National Electrical Safety Code (NESC), 1949.

Note.—No. 1961-23 is Part 2 of the copyrighted Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, Vol. 87, No. ST 5, June, 1961. Copyright 1961 by the American Society of Civil Engineers.

The NESC Code has recently been revised, but no change has been made in the structural provisions of it. The code was primarily written to cover the electrical features of transmission lines, and is vague or deficient on items concerning the structural design. It was also written primarily to provide rules for safety and clearances, without the intent to restrict the structural designer by imposing design formulas and considerations on him, but rather to afford the designer a freedom of choice in preparing a tower design.

This leaves the determination of design criteria to the discretion of the designer. As a result, instances of tower failures and use of unsatisfactory designs have occurred many times.

Some of the omissions and inconsistencies noted in the NESC Code are:

1. Light Loading Versus Heavy Loading

The horizontal wind pressure on $\frac{1}{2}$ " radial ice covered wires as specified in the N.E.S.C., is 4 p.s.f. for the heavy loading district. The horizontal wind pressure on bare wires as specified in the N.E.S.C. is 9 p.s.f. for the light loading district. Based on the above, it is possible to design a tower for a heavy loading district and yet it might be deficient for the light loading district. This would be true in every case where the wire diameter exceeds 0.8" and where only vertical and transverse wind loads are considered. For example, consider a 954MCM, 54A/7, A.C.S.R. conductor. For a light loading district, the wind load is .897 p.l.f. as compared to .732 p.l.f. for a heavy loading district. For a two circuit line with 1100' spans, the tower in a light loading district would be subject to 1090 lbs. more load transversely than if it had been designed for a heavy loading district.

2. "The Weight Of Ice On The Tower Is Ignored For The Sake Of Simplicity."

The above is a direct quote from the N.E.S.C. If $\frac{1}{2}$ " radial ice is specified on all wires as called for in heavy loading districts in the N.E.S.C., why should the tower be considered immune to the same ice that forms on the wires? This can be a considerable additional weight to incorporate in the design. If $\frac{1}{2}$ " ice was figured on all members in a two circuit 230 KV tower weighing 12,000 lbs. without ice, the additional weight due to ice on the tower would be approximately 7000 lbs. This is almost equal to the 8000 lbs. of ice brought into the tower by the $\frac{1}{2}$ " radial ice on 6 conductors and two ground wires! So, why ignore it?

3. Effective Tower Area Exposed To The Wind

The code states that . . . "the actual exposed area of one lateral face shall be increased by 50% to allow for the pressure on the opposite face." "The results obtained by more exact calculations may be substituted for the values obtained by this simple rule." We agree whole heartedly with the second statement although in practice, we have not seen it followed. The first statement, calling for 50% of the leeward tower face to be exposed to the wind, is generally the one that has been followed. That this is not a realistic premise is evident when the tower trusses are spaced far apart. Certainly the wind can blow through the open spaces in the windward face, and act on all the exposed area in the leeward face. The A.S.C.E. took an

important step towards resolving this problem in their recent wind symposium.

4. Simultaneous Application Of Loads

The code states that, "When calculating transverse strength, the assumed transverse and vertical loads shall be taken as acting simultaneously."

"In calculating longitudinal strength, the assumed longitudinal loads shall be taken without consideration of the vertical or transverse loads."

It is hard to imagine that anyone would follow these recommendations literally, but we have seen designs in which the tower was not designed for the combination of specified vertical, transverse and longitudinal loads.

5. Yield Point

The code states that the towers should be designed using overload factors on the loads, and to use the yield point of steel as a limiting stress. Any recognized handbook will show that the yield point of A7 steel is 33,000 p.s.i., but a recent experience shows that some designers are capitalizing on the fact that the actual yield point is not specified in the code.

We learned of a recent failure in which the tower was found to be designed not in accordance with the code. The designer pointed out that the code placed no limiting value on the yield point. Although he could not have anticipated this in his original design, he argued that since the mill reports showed values for yield point in the 43,000 p.s.i. range, his tower was able to take more load and thus would satisfy the N.E.S.C. requirements. It is common knowledge that yield reports on A7 steel run over 40,000 p.s.i. and are in excess of the 33,000 p.s.i. yield point specified in the A.I.S.C. We do not recommend taking advantage of this because the reports are not consistent, and because of the innumerable additional stresses that are introduced in a tower because of eccentric connections causing moments and additional stresses.

6. Strength Of Foundations

Quoting from the N.E.S.C.:

A. Steel Supports

"The foundations and footings shall be so designed and constructed as to withstand the stresses due to the loads assumed in rule 252."

"Steel parts shall withstand these loads with the overload capacity factors specified in table 16."

Rule 252 in the N.E.S.C. does not mention overload factors. Does the above quotation mean that only if a steel grillage is used shall the footings be designed using overload factors and that if a concrete footing is used, no overload factors should be used? We have heard of some designers who argue that this is the intent. We must confess we are unable to follow the thought here.

- B. "Foundations must, in general, be designed to withstand bearing, uplift, and a lateral force tending to slide or overturn them. The downward force need scarcely if ever be considered, as foundations designed for uplift will invariably develop adequate bearing power. Perhaps one exception to this would be in swampy ground where it may even be necessary to resort to the use of piles to give adequate bearing."

The second statement could lead to serious trouble if followed. We have seen instances where the soil for resisting uplift was adequate on the basis that it was capable of providing a resistance to uplift equivalent to that provided by a 30° cone of earth, but was unsatisfactory for resisting upward pressure of the footing against the soil, due to uplift.

7. Wind On Tower

The N.E.S.C. states that the tower standing free before the wires are strung, must be able to take a transverse wind capable of exerting 42.9 p.s.f. on the tower. This is roughly equivalent to a true wind velocity of 103 M.P.H. Yet, this same tower, after all the wires are strung, and more surface is exposed to the wind, is called upon to resist a lesser force of 16.5 p.s.f. or 64.2 M.P.H.!

You will notice that the tower is to be designed to take this wind in a transverse direction only, and no mention is made of what wind pressure the tower is to be designed for in the longitudinal direction.

8. Compression Formulas

No design compression formulas for either A7 or high strength steel are specified in the code.

Often, a bidder bidding in competition will select one of the numerous empirical formulas available that will give him the highest allowable compressive stress.

9. Tension Members

Another restriction not in the code, is a limiting L/r ratio for tension members. A designer pursuing a competitive course in the design of a tower could very easily run this value up over what it should be. We have seen designs in which the L/r of some of the main tension members was over 1000!

Frequently, tension members acting as part of an X bracing system, are called upon to act as redundant bracing for the compression leg of a tower and cannot act as part of a compression system if they are too limber.

So, designing to meet the N.E.S.C. requirements, is not the entire answer to a good tower design. Too much is left to the discretion of the designer and where he is bidding in competition with others, it is understandable if he takes full advantage of anything that would reduce the weight of the tower.

A canvas was made of the fabricators responsible for most of the tower fabrication in the country for their attitudes towards formation of this task committee. In the original letter to the Executive Committee of the Structural Division last year for application to form this task committee, quotes were given from answers to the canvas. Among others, wholehearted interest and support was given by Anchor Metals, American Bridge Co., Flint Steel Corporation, The Charles E. Schuler Engineering Co., Bethlehem Steel Company, and the American Institute of Electrical Engineers.

One idea for the new code was to have it incorporated into a revised edition of the NESC Code. This was considered an excellent objective, but might require several years, so it is considered more practical to produce the new design specification and then attempt to obtain agreement on it by the AIEE, AEIC and EEI before submitting it to the National Bureau of Standards for use in the NESC Code. In this way, it could be used by any individual companies at once for the purchase of transmission towers, and certainly would have some influence on its ultimate adoption into the NESC.

Several committee meetings have been held. It is planned to have committee recommendations assembled by July 1st, and then have a general committee meeting in the Fall to discuss them. The grouping of assignments together with the committee personnel is as follows:

J. R. Arena, Chairman

Overloads: H. Miller Walton, Sub-Chairman; John Umstead; Sidney Alpert.

Wind: Jack Billingsley, Sub-Chairman; Kenneth Sharp; Dr. Sidney Shore.

Ice: Wm. G. Logan, Sub-Chairman; Kenneth Sharp; F. W. Rechterman.

Compression Formulae Based on Yield Points: H. Miller Walton, Sub-Chairman; Jack Billingsley, Dr. Sidney Shore.

L/r Determination: F. W. Rechterman, Sub-Chairman; Jack Billingsley; S. A. Wilson.

Reduction for O.S. Leg Bolts; Minimum Thickness: S. A. Wilson, Sub-Chairman; Wm. G. Logan; Sidney Alpert.

L/R for Tension Members; Detailing; Eccentricities: Kenneth Sharp, Sub-Chairman; F. W. Rechterman; H. Miller Walton.

Longitudinal Load Due to Unequal Spans and/or Difference in Elevation: Sidney Alpert, Sub-Chairman; John Umstead; Wm. G. Logan.

Tower Tests: John Umstead, Sub-Chairman; S. A. Wilson; H. Miller Walton.

(These are new committee appointments and do not appear in the Official 1961 ASCE Register.)

COLLAPSE of the TEXAS TOWER No. 4

The Administrative Committee on Loads and Stresses of the Structural Division has asked J. R. Arena to follow closely the studies that are being made by other organizations and groups of the recent failure of the Texas Tower No. 4 in the Atlantic. Mr. Arena is Chairman of the ASCE Task Committee on Tower Design which is a part of the Committee on Loads and Stresses. He has also been asked to assemble, study and evaluate the knowledge gained

through these other investigations, and at the appropriate time to present this information to the ASCE.

Anyone who has information regarding those studies is asked to communicate with Mr. J. R. Arena, c/o Sargent & Lundy, 140 S. Dearborn St., Chicago 3, Ill.

WORLD CONFERENCES on EARTHQUAKE ENGINEERING

Following are extracts of a letter to Emerson J. Ruble, Chairman of the Structural Division, from John E. Rinne, Engineer of the Standard Oil Company, of California, 225 Bush Street, San Francisco, California. It explains some of the activities of these conferences:

"When I was in Japan at the Second World Conference on Earthquake Engineering in July 1960, I was asked to represent the United States on what they called a Preparatory Committee to look into the formation of a national organization on earthquake engineering. The objectives of such an organization, in accordance with a resolution adopted at the closing session of the conference at Kyoto, would be 'to foster and encourage international cooperation in all aspects of earthquake engineering, including planning of world conferences, dissemination of technical information, results of research, inspection of earthquake damage and reports, and other pertinent matters.'

"In essence, this international organization would presumably be similar to those now operating in the fields of dams and soil mechanics and foundations. Primarily, its function would be that of planning world conferences which might be held at about four year intervals. The participation of the international organizations on matters of dissemination of information, research, and inspection of earthquake damage should be of secondary importance. It is the feeling of most of us here that we should not get too involved in these latter activities, at least not until it can be established that there is a better way of handling these than the way we have been handling them in the past. Hence, I'm advocating that we go slowly on this.

"As regards the next conference, 3WCEE, a formal invitation from the Government of New Zealand was received at the conference last July, plus informal invitations from Chile and India. The United States delegation to 2WCEE favors acceptance of the New Zealand invitation. The date for this conference has not been established, but will probably be in late 1964, or possibly early 1965."

Mr. Rinne further stated that he had been asked to represent the United States on a preparatory committee to form an international organization on earthquake engineering, and he requested the endorsement of the Structural Division. At the Executive Committee meeting of the Structural Division in March at Chicago, it was decided that Mr. Rinne's request be forwarded to Mr. Wisely, ASCE Executive Secretary, with the recommendation that ASCE be represented on this preparatory committee, and that Mr. Rinne, because of his excellent qualifications, be appointed as that representative.

PUBLICATIONS OF THE EARTHQUAKE ENGINEERING
RESEARCH INSTITUTE

The Earthquake Engineering Research Institute recently announced a new publication,

TRANSLATIONS IN EARTHQUAKE ENGINEERING, by the Earthquake Engineering Research Institute under a grant from the National Science Foundation.

This group of translations is entirely from recent publications in the Russian language and consists of seven papers dealing with various facets of engineering seismology, together with the detailed USSR Standards and Regulations for Building in Seismic Regions.

The seven papers are as follows:

**THE FUNDAMENTAL PREMISES OF THE DYNAMIC THEORY OF
SEISMIC RESISTANCE**

A METHOD OF DESIGNING BUILDINGS FOR SEISMIC FORCES

THE DESIGN OF FLEXIBLE STRUCTURES FOR SEISMIC LOADS

**A SIMPLIFIED METHOD FOR EARTHQUAKE RESISTANT DESIGN OF
STRUCTURES**

**ON THE INTERACTION BETWEEN MASONRY FILLER WALLS AND
ENCLOSING FRAME WHEN LOADED IN THE PLANE OF THE WALL**

**CERTAIN DESIGN PROBLEMS OF REINFORCED CONCRETE FRAME
STRUCTURES FOR SEISMIC REGIONS**

VIBRATION OF TALL BUILDINGS

The translations will give the reader an insight into both the theoretical and applied aspects of earthquake engineering in the USSR, and will likewise indicate the increasing work being done by their scientists and engineers.

The book will prove both useful and interesting to all concerned with recent developments in engineering seismology.

The book is 150 pages, 7" x 10½". Price is \$3.25 paperbound or \$5.00 cloth-bound. Address of the Institute, which also has published four other books, is P.O. Box 85, Berkeley 1, California.

**TASK COMMITTEE ON THE STUDY OF BUILDING CODES AND
SPECIFICATIONS**

The Task Committee on the Study of Building Codes and Specifications will be studying the existing codes from the broad approach of policy and functional considerations, rather than from the technical and problem solving attitudes, and will review such areas of need as a constructive critic. Special problems of a technical nature will be referred to appropriate committees or new sub-committees organized for this purpose.

All engineers who wish to be active in the broader aspects of codes and specifications, whether from the approach of design, of construction, of supply or of administration, are encouraged and invited to express such interest by writing to Charles W. Yoder, 3505 West Center Street, Milwaukee 10, Wisconsin.

REINFORCED CONCRETE RESEARCH COUNCIL

The officers of the RCRC have asked the NEWS to report that reprints of the RCRC bulletins may be obtained through the Portland Cement Association, either at the PCA District Office throughout the country, or from 33 West Grand Avenue, Chicago 10, Illinois. Thirteen bulletins have been issued so far. These bulletins represent council investigations and are usually printed first in the ASCE Proceedings, or in the ACI Journal.

Since 1960, the Reinforced Concrete Research Council (RCRC) has been sponsored by the ASCE. In the 1961 Official ASCE Register, it is listed on page 18 under committees of the Department of Technical Activities.

Originally organized in 1951 under the sponsorship of the Engineering Foundation, the purpose of the RCRC is to stimulate, guide and assist in initiating and financing research in the field of reinforced concrete, and to make available the results of such research; to organize and administer cooperative research projects, and in cooperation with committees of technical societies, to interpret research results in the form of recommendations for the design of concrete structures.

Membership of the Council consists of organizations which designate representatives, and of individuals who are qualified to assist in carrying out the objectives and policies of the Council as an autonomous organization under the sponsorship of the ASCE. Thor Germundsson is Chairman.

If you had sent us
some news, 16,556
members could have
read it here.

Meeting of Joint ASCE-ACI Task
Committee on Composite Construction

The Committee met in conjunction with the American Concrete Institute meeting in St. Louis in February. The meeting was devoted to reviewing research work now in progress in the field of composite construction. Professor Driscoll of Lehigh University reviewed the work which they have been doing in attempting to determine a plastic design procedure for steel beams used in composite construction. The effect of the number of shear connectors and the spacing of the connectors is being investigated.

Dr. Chinn reviewed an initial pilot program being conducted to determine the stud shear values of composite construction when used with lightweight concrete. This is the first work which has been done to determine how lightweight concrete will work with composite construction.

Professor Washa reviewed work being conducted at the University of Wisconsin on the shear connection between cast-in-place concrete slabs and precast concrete beams. The effect of various types of surface preparations on the bond resistance is under study, as well as effective methods of developing the necessary horizontal shear resistance for this type construction.

Dr. Chapman of Imperial College of London reviewed some detailed studies which have been made of composite construction using steel beams and poured-in-place concrete slabs. He reported on some detailed studies measuring uplift forces between the two components and also on some tests comparing rigid and flexible type connectors.

At the committee meeting it was agreed that new subcommittees would be set up to review and revise the present tentative recommendations which were published this past year. In addition, a subcommittee was established to attempt to establish a common terminology to be used for all researchers and designers in the field of composite construction.

ANNOUNCEMENT

FOURTH U. S. NATIONAL CONGRESS OF APPLIED MECHANICS

UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA

JUNE 18 - 21, 1962

The U. S. National Congresses of Applied Mechanics are held every fourth year under the auspices of the U. S. National Committee on Theoretical and Applied Mechanics, a joint committee of the American Institute of Chemical Engineers, the American Mathematical Society, the American Physical Society, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Institute of the Aerospace Sciences, and the Society for Experimental Stress Analysis. These Congresses are planned to supplement the International Congresses of Applied Mechanics but not to compete with them. Accordingly, no effort is made to attract papers from outside the U.S. and Canada, although there is no rule against their presentation.

All research workers in the field are cordially invited to submit papers constituting original experimental or theoretical contributions to Applied Mechanics, including mechanics of rigid bodies and deformable solids, mechanics

of fluids and gases, thermodynamics and heat transfer. Instructions to authors of papers are given at the end of this announcement. It is expected that papers accepted by the Editorial Committee with the advice of recognized authorities and presented at the Congress, will be published in full in the Proceedings of the Congress.

To be considered for presentation at the Congress, complete papers and manuscripts must be submitted to the Chairman of the Editorial Committee before January 1, 1962; to be scheduled for presentation the final manuscript of a paper must have been accepted before May 1, 1962. To avoid delays caused by overburdening reviewers and editorial staff, authors are urged to submit manuscripts well ahead of the deadline of January 1, 1962.

The papers will be grouped by subject and 30 minutes will be allotted for presentation and discussion of each paper. Arrangements will also be made for general lectures by outstanding authorities on subjects of general interest to members of the Congress. Facilities will be provided for informal discussions and social contact.

Rules for preparation of papers (not more than 5,000 words) as well as more information on the congress may be obtained from the Secretary of the conference, W. Goldsmith, Department of Applied Mechanics, University of California, Berkeley 4, California.

EXECUTIVE COMMITTEE MEETING NEWS

A meeting was held in March of the Executive Committee of the Structural Division at Mr. Emerson Ruble's office in Chicago. The minutes of this meeting, covering two days, stretches over 24 pages of single-spaced typing. Two principal items were:

A discussion was held of the merits of a research project to prepare a structural steel research summary in which a list or digest of current research would be established. It was pointed out that such summaries are made regularly by other organizations, particularly ACI which publishes such a summary every year, listing research projects by name with the names of principal investigators and a very short description of the projects. The Welding Research Council was also recognized as publishing a similar research summary. After considerable discussion, the matter was referred back to committee for further study.

For the New York Meeting (October 16-20, 1961), it was reported that plans for the convention are well under way. The theme for this convention has been chosen as "Joints and Joining Methods." Sessions have now been scheduled for the Structural Division on Monday afternoon, Tuesday morning, Tuesday afternoon, Wednesday afternoon, Thursday morning and afternoon and Friday morning and afternoon. The Monday afternoon session is scheduled as a joint session with the Construction Division; The Tuesday morning session is being held jointly with the Engineering Mechanics Division; and the Tuesday afternoon session is a joint session with the Engineering Mechanics Division, also. A research review session is being arranged for Wednesday afternoon similar to the one that was held at the October, 1960 meeting in Boston. The Thursday morning and afternoon sessions are being arranged on the subject of steel connections; at the present four papers are scheduled from the University of Illinois, one from Cornell, and one from Lehigh. The Friday morning session is scheduled for concrete connections, and four papers are to be presented. The Friday afternoon session will be devoted to epoxy resins and timber connections.

It was also suggested that the Newsletter might appropriately carry brief reports of the various research council meetings, that the status of work being performed by the task committees might also be included, and that announcements of new specifications that have been adopted could be reported in the Newsletter.

NEWSLETTER NOTES

The NEWS, or NEWSLETTER, is intended to be an informal clearing house for news of the Structural Division. It is also a medium for "reader comment," and written thoughts and ideas are solicited. Do you know that we have a circulation of over 16,500? We are the largest technical division in ASCE, second place being held by the Construction Division with 10,910 registrants, and third place is held by the Hydraulics Division with 5,972 registrants.

The Journal of the Structural Division, as well as the NEWS, is on a new publication schedule. New standards for acceptance of papers has increased the quality and decreased the quantity of papers. As a result, the Journal will be on a bi-monthly schedule. When this policy was put into effect in March, our plans for a May issue of the NEWS were necessarily pushed on to this June issue.

Contributions for an August issue should reach the Editor by June 30th.
Address:

Frank Randall, Newsletter Editor
c/o P.C.A.
111 W. Washington St.
Chicago 2, Illinois

TO ASCE MEMBERS OF CHI EPSILON

Chi Epsilon Fraternity, national civil engineering honor society, has officially offered to supply the funds necessary to furnish a formal Conference Room at the United Engineering Center. This room will be on the ASCE executive floor, will be named "The Chi Epsilon Room," and will be available for conference and committee meetings.

Pledges are not expected, but single voluntary gifts, from members and friends of the Fraternity are earnestly solicited. An attractive Commemoration Book has been planned in which donors of \$100 or more (singly or in groups) may inscribe the name of a revered person.

On request, the national chairman, Samuel Kramer (8701 Shore Road, Brooklyn 9, New York) will be glad to mail a descriptive brochure. Your gift is tax deductible if you make your check out to "ASCE CHI EPSILON ROOM FUND" and mail it to Mr. Donald D. King, ASCE, 33 West 39th Street, New York 18, N.Y. Your gift will be automatically credited to the quota of your initiating Chapter. The national goal is \$10,000.

PAPERS FROM THE 2nd CONFERENCE ON ELECTRONIC COMPUTATION

The papers presented at the 2nd Conference on Electronic Computation in Pittsburgh, September 8-9, 1960, are being offered in a single hard-bound volume. This special edition is composed of the thirty two technical papers,

the welcome address, keynote address and three luncheon addresses, all as delivered at the Conference. The price (post-paid) is as follows:

Cost per copy	<u>Members</u>	<u>Non Members</u>
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ERRATA

CONFERENCE PAPERS, 2nd CONFERENCE ON ELECTRONIC COMPUTATION

"Error Analysis for Eigenvalue Problems" by Robert B. McCalley, Jr.

Page 526, Eq. 10: The last term should read $-V^T M V A$.

Page 543, last line: The last term in F should read $-V^T (dM) V A$.

Page 544, line 19: Change P_{ij}^2 to p_{ij}^2 .

Page 544, line 30: Change $V_c \sigma$ to $V_{c\sigma}$.

Page 546, 5th line of equations: Change - to + before $V^T M (dV) A$.

Page 546, Eq. 69: The last term should read $-V^T (dM) V A$.

The errors in the equations do not appear in the numerical computations.

CUMULATIVE INDEX TO ASCE PUBLICATIONS

A three-part index to Proceedings, Transactions, and CIVIL ENGINEERING is now available. This 816-page, 6 in. by 9 in., blue cloth bound book contains a subject and name index for CIVIL ENGINEERING that covers the magazine since its inception in 1930 through 1959. For Proceedings, the coverage is from 1950 through 1959, a period in which most papers were not included in Transactions. The 1935 through 1959 Transactions are indexed to provide a valuable source of reference to "modern" technical civil engineering literature.

The list price for this volume is \$20.00. Members of ASCE and public and

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PLASTIC DESIGN IN STEEL

The evaluation of a considerable amount of research work has demonstrated the applicability of plastic analysis to structural design. For the type of structure to which its application is intended, plastic design results in an overall balanced design, and a more economical use of material than conventional methods. In comparison with allowable stress ("elastic") design methods, plastic design is a simpler design technique. As a consequence, designers have chosen the plastic design method for more than 2,000 structures built in the United States and abroad.

The most-recent addition to the series of ASCE Manuals of Engineering Practice is a "Commentary on Plastic Design in Steel." This Manual is the result of a joint effort of a committee from the Welding Research Council and the Engineering Mechanics Division of ASCE. Although much of the experimental and theoretical work was performed at Lehigh University, the joint committee has broadened this Commentary by including the results of research at other institutions, both in the United States and abroad.

The list price is \$7.00; ASCE members and public and school libraries will pay \$3.50. This Manual is available in either cloth binding or in paper covers; there is no differential in cost.

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